CLAIMS

What is claimed is:

1. A plasma generating system, comprising:

a plasma chamber configured to generate a plasma, wherein the plasma chamber disassociates one or more precursors to generate the plasma; and

a spectrometer configured to receive emissions from the plasma chamber during the formation of the plasma and to generate one or more spectra from the one or more emissions, wherein the one or more spectra may be used to determine precursor disassociation.

2. The plasma generating system as recited in claim 1, wherein the plasma is used to facilitate at least one of cleaning a deposition chamber, etching a layer of an integrated circuit, and depositing a layer of an integrated circuit

3. The plasma generating system as recited in claim 1, wherein the plasma chamber comprises an applicator in a remote plasma cleaning system.

4. The plasma generating system as recited in claim 1, wherein the plasma chamber is configured to generate a plasma using at least one of microwaves, AC voltage, and RF voltage.

5. The plasma generating system as recited in claim 1, wherein the one or more precursors comprise at least one of nitrogen trifluoride, silane, germane, ammonia, phosphine, titanium chloride, tantalum chloride, molybdenum hexafluoride, tetraethyl orthosilicate, and tungsten fluoride.

6. The plasma generating system as recited in claim 1, wherein the spectrometer comprises an optical spectrometer and the emissions comprise optical emissions.

7. The plasma generating system as recited in claim 1, wherein the spec trometer comprises one of a near infrared spectrometer and a Raman spectrometer.

8. The plasma generating system as recited in claim 1, wherein the spectrometer receives the emissions via a fiber optic cable.

9. The plasma generating system as recited in claim 1,further comprising a computer configured to receive the one or more spectra from the spectrometer.

10. The plasma generating system as recited in claim 9, wherein the computer is configured to compare a spectrum component of interest and a refere nce value.

11. The plasma generating system as recited in claim 10, wherein the computer is configured to terminate generation of plasma in the plasma chamber when the spectrum component of interest deviates from the reference value by at least a threshol d amount.

12. A remote plasma generation system, comprising

a magnetron powered by a power source, wherein the magnetron is configured to generate microwaves;

an applicator configured to receive microwaves from the magnetron via a waveguide and to generate a plasma which disassociates a precursor into two or more reactive species;

an optical spectrometer configured to receive optical emissions from the applicator via an optical fiber cable and to generate one or more optical spectra from the optical emissions which indicate the presence or absence of the two or more reactive species; and

a deposition chamber configured to receive the two or more reactive species, wherein at least one reactive species reacts with a material in the deposition chamber.

13. The remote plasma generation system as recited in claim 12, further comprising an isolator between the magnetron and the waveguide.

14. The remote plasma generation system as recited in claim 12, wherein the optical fiber cable is mounted on a viewport of the applicator.

15. The remote plasma generation system as recited in claim 12, wherein the precursor comprises at least one of nitrogen trifluoride, silane, germane, ammonia, phosphine, titanium chloride, tantalum chloride, molybdenum hexafluoride, tetraethyl orthosilicate, and tungsten fluoride.

16. The remote plasma generation system as recited in claim 12, wherein the two or more reactive species comprise at least fluorine radicals.

17. The remote plasma generation system as recited in claim 16, wherein the material comprises at least one of silicon dioxide and silicon nitride.

18. A method for determining the adequacy of a plasma, comprising:

generating a plasma in a plasma chamber to attempt to disassociate one or more precursors in the plasma chamber to form two or more reactive species;

acquiring optical emissions from the plasma chamber;

generating one or more optical emission spectra from the optical emissions; and

determining whether at least one reactive species is present in the plasma chamber based upon the one or more optical emission spectra.

19. The method as recited in claim 18, wherein generating a plasma in a plasma chamber comprises applying microwaves to generate a plasma in an applicator.

20. The method as recited in claim 18, wherein the one or more precursors comprise at least one of nitrogen trifluoride, silane, germane, ammonia, phosphine, titanium chloride, tantalum chloride, molybdenum hexafluoride, tetraethyl orthosilicate, and tungsten fluoride.

21. The method as recited in claim 18, wherein acquiring optical emissions comprises mounting an optical fiber cable to a viewport of the plasma chamber such that optical emissions from the plasma chamber pass through the optical fiber cable.

22. A method of manufacturing an integrated circuit, comprising:

situating a silicon wafer in a deposition chamber;

generating a plasma in a plasma chamber to attempt to disassociate one or more precursors in the plasma chamber to form two or more reactive species;

acquiring optical emissions from the plasma chamber;

generating one or more optical emission spectra from the optical emissions; determining whether at least one reactive species is present in the plasma chamber based upon the one or more optical emission spectra; and, if so,

processing the silicon wafer to form an integrated circuit.

23. The method as recited in claim 22, further comprising at least one of:

reacting the at least one reactive species with the silicon wafer if the at least one reactive species is determined to be present; and

terminating the production of the integrated circuit if the at least one reactive species is not determined to be present.

24. The method as recited in claim 23, further comprising notifying an operator of an error condition if the at least one reactive species is not determined to be present.

25. The method as recited in claim 23, wherein reacting the at least one reactive species with the silicon wafer comprises forming a deposition layer on the silicon wafer comprising a reacted form of the at least one reactive species.

26. The method as recited in claim 23, wherein reacting the at least one reactive species with the silicon wafer comprises etching an exposed layer of the silicon wafer.

27. The method as recited in claim 22, wherein generating a plasma in a plasma chamber comprises applying microwaves to generate a plasma in an applicator.

28. The method as recited in claim 22, wherein the one or more precursors comprise at least one of nitrogen trifluoride, silane, germane, ammonia, phosphine, titanium chloride, tantalum chloride, molybdenum hexafluoride, tetraethyl orthosilicate, and tungsten fluoride.

29. The method as recited in claim 22, wherein acquiring optical emissions comprises mounting an optical fiber cable to a viewport of the plasma chamber such that the optical emissions from the plasma chamber pass through the optical fiber cable.

30. A method of monitoring the cleaning of a deposition chamber, comprising:

generating a plasma in a plasma chamber to attempt to disassociate one or more precursors in the plasma chamber to form two or more reactive species;

acquiring optical emissions from the plasma chamber;

generating one or more optical emission spectra from the optical emissions;

determining whether at least one reactive species is present in the plasma chamber based upon the one or more optical emission spectra; and, if so,

providing the at least one reactive species to a deposition chamber.

31. The method as recited in claim 30, further comprising at least one of:

reacting the at least one reactive species with a deposition residue in a deposition chamber in gaseous communication with the plasma chamber, if the at least one reactive species is determined to be present; and

terminating the cleaning of the deposition chamber, if the at least one reactive species is not determined to be present.

32. The method as recited in claim 31, wherein the plasma chamber is the deposition chamber.

33. The method as recited in claim 31, further comprising notifying an operator of an error condition if the at least one reactive species is not determined to be present.

34. The method as recited in claim 31, wherein reacting the at least one reactive species with a deposition residue comprises reacting fluorine radicals with silicon dioxide.

35. The method as recited in claim 30, wherein generating a plasma in a plasma chamber comprises applying microwaves to generate a plasma in an applicator.

36. The method as recited in claim 30, wherein the one or more precursors comprise at l east one of nitrogen trifluoride, silane, germane, ammonia, phosphine, titanium chloride, tantalum chloride, molybdenum hexafluoride, tetraethyl orthosilicate, and tungsten fluoride.

37. The method as recited in claim 30, wherein acquiring optical emissio ns comprises mounting an optical fiber cable to a viewport of the plasma chamber such that the optical emissions from the plasma chamber pass through the optical fiber cable.

38. An integrated circuit manufacturing system, comprising:

means for situating a silicon wafer in a deposition chamber;

means for generating a plasma in a plasma chamber to attempt to disassociate one or more precursors in the plasma chamber to form two or more reactive species;

means for acquiring optical emissions from the plasma chamber;

means for generating one or more optical emission spectra from the optical emissions;

means for determining whether at least one reactive species is present in the plasma chamber based upon the one or more optical emission spectra; and, if so, processing the silicon wafer to form an integrated circuit.

39. A deposition chamber cleaning system, comprising:

means for generating a plasma in a plasma chamber to attempt to disassociate one or more precursors in the plasma chamber to form two or more reactive species;

means for acquiring optical emissions from the plasma chamber;

means for generating one or more optical emission spectra from the optical emissions;

means for determining whether at least one reactive species is present in the plasma chamber based upon the one or more optical emission spectra; and, if so,

means for providing the at least one reactive species to a deposition chamber.